Title
DIFFERENCES IN THE HIPPOCAMPAL GABAERGIC SYSTEM BETWEEN SEIZURE-SENSITIVE AND SEIZURE-RESISTANT GERBILS

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PETERSON, G.M.*, C.E. RIBAK and W.H. OERTEL*, Department of Anatomy, University of California, Irvine, California and Department of Neurology, Technical University, Munich, FRG. (Sponsored by Robert H.I.Blanks). Differences in the Hippocampal GABAergic System Between Seizure-Sensitive and Seizure-Resistant Gerbils.

Previous light microscopic studies have shown differences in the number of dendritic spines of hippocampal neurons between seizure-sensitive (SS) and seizure-resistant (SR) gerbils. Our previous data on focal seizures have indicated a preferential loss of GABAergic neurons at epileptic foci. This present study was undertaken to determine if a defect in the GABAergic system occurs in the brains of SS gerbils, a genetic model of generalized epilepsy. Brains of both types of gerbils were perfused and sectioned and incubated in antiserum prepared to glutatmate decarboxylase (GAD) to localize the GABAergic terminals and somata. The hippocampal formation was analyzed both qualitatively and quantitatively for differences between these two congenic strains. A striking difference occurs in the number of basket cell somata in the suprapyramidal blade of the dentate gyrus granule cell layer. The number of these GAD+ somata in SS gerbils was about 80% more than that found in SR gerbils. In contrast, the infrapyramidal blade did not display any differences in the number of basket cell somata. However, the number of GAD+ basket cell terminals in the granule cell layer of SS gerbils is approximately twice that of SR gerbils for both blades of the dentate gyrus. The molecular layer displays a difference for only the GAD+ somata in the infrapyramidal blade while no differences in GAD+ terminals occurs in this region. The number of GAD+ hilar neurons is approximately 20% higher in SS gerbils as compared to SR. An analysis of the CA3-CA1 sub-regions of the hippocampus indicates that the number of GAD+ neurons in SS gerbils is approximately twice that in SR gerbils. These data indicate clearcut differences in the GABAergic system between these two gerbil strains. The fact that the epileptic gerbils have increased numbers of GABAergic neurons and terminals is opposite to our GABA hypothesis for cortical focal epilepsy. These data may be due to by a severe loss of GABA neurons elsewhere in these brains and a compensatory increase of these neurons in the hippocampus. In any case, it is clear that the circuitry of the hippocampus is dramatically different in these two strains of gerbils which differ in their sensitivity to seizures. Supported by NIH grant NS-15669 and the Klingenstein Foundation.